Hands-On Machine Learning Course:

Mastering Machine Learning: From Theory to Real-World Applications

This Hands-On machine learning course is meticulously designed to bridge the gap between theoretical knowledge and practical application. Each topic within the syllabus is not just a conceptual overview but a doorway to hands-on learning experiences. Here's what makes this course unique:

Dual Approach to Learning:

Theory in Depth: Before diving into applications, we lay a solid theoretical foundation for each machine learning concept. This ensures that students not only know the 'how' but also the 'why' behind each algorithm and technique.

Practical Projects: Every module is paired with a real-world dataset project. These projects are carefully selected to reinforce the theoretical concepts learned and to provide firsthand experience in solving actual problems.

Diverse Sectors: The datasets span a variety of industries. Ensuring learners gain exposure to a wide range of scenarios.

Build from Scratch: For each module, students will actively participate in building models, tuning parameters, and analyzing results, ensuring a deep understanding of each algorithm's mechanics and applications.

Tools and Technologies: Learners will use leading machine learning libraries and tools, preparing them for industry-standard practices and methodologies.

By integrating theoretical depth with practical projects, this course aims to equip learners with not just the knowledge but also the skills to apply machine learning in a variety of contexts. Whether you're looking to solve specific business problems, advance your career, or delve into research, this course provides the tools and insights to help you succeed.

Prerequisites:
Basic Knowledge of Python:

Familiarity with basic Python syntax and programming constructs (loops, conditionals, functions).

Understanding of Python data types (lists, dictionaries, tuples).

NOTE: Foundational Python Concepts for this program will be covered in the first two sessions.

Fee:
The course fee is **₹ 30,000**

Module 1: Data Preparation and Analysis

Section 1: Python

- Basic Python usage for machine learning tasks, including syntax, data structures, and essential libraries.

Section 2: Using NumPy

- Introduction to NumPy for numerical operations, covering array manipulations, mathematical functions, and efficient computations.

Section 3: Working with Data

- Data handling: collection, cleaning, and manipulation, including techniques for dealing with missing values, outliers, and data transformations.
- Creating and managing datasets for machine learning, focusing on data sources, formats, and preprocessing steps.

Module 2: Regression Techniques

Section 4: Linear Models

- Basic Linear Analysis: Understanding the relationship between two variables through a linear approach, with detailed explanations of the underlying theory and mathematics.
- Enhanced Linear Models: Expanding simple linear models to accommodate multiple predictors, including multivariate regression and its theoretical foundations.
- Polynomial Linear Analysis: Introducing non-linearity within linear models through polynomial transformations, with mathematical derivations and practical applications.

Section 5: Tree-Based Methods

- Tree-Based Regression: Utilizing decision trees to model non-linear relationships, covering the algorithm, mathematical concepts, and practical implementation.
- Forest-Based Regression: Leveraging the power of multiple decision trees to improve prediction accuracy, including an in-depth look at random forests, their theory, and ensemble methods.

Module 3: Classification Methods

Section 6: Foundational Models

- Binary Outcome Modeling: Basics of modeling binary outcomes with logistic regression, with a focus on the theoretical aspects and practical usage.
- Nearest Neighbors Approach: Classifying based on the similarity to neighboring data points, explaining the mathematics behind distance metrics and nearest neighbor algorithms.

Section 7: Support Vector and Probabilistic Models

- Margin-Based Classification: Introduction to SVM and the concept of maximizing the margin between classes, including the mathematical formulation and kernel methods for non-linear separations.
- Bayesian Models: Applying Naive Bayes for probabilistic classification, covering the principles of Bayesian statistics and probability theory.

Section 8: Tree-Based Classification

- Detailed exploration of using decision trees and random forests for classifying data into categories, with a thorough explanation of the algorithms, theory, and practical considerations.

Module 4: Grouping and Associations

Section 9: Cluster Analysis

- Centroid-Based Clustering: Principles of K-Means and its application in grouping similar data points, including the mathematical derivation and practical examples.

- Hierarchical Grouping: Understanding hierarchical clustering methods and their applications, with a focus on the algorithms, dendrograms, and practical use cases.

Section 10: Association Rules

- Market Basket Analysis: Learning the basics of the Apriori algorithm for association rule learning, covering the theory, support, confidence, and lift metrics.
- Efficiency in Association: Introduction to the Eclat algorithm for faster association rule mining, with a focus on the underlying principles and efficiency improvements.

Module 5: Deep Learning Fundamentals

Section 11: Introduction to Neural Networks

- Historical context, basic structure, and operation of artificial neurons and networks, including the theory and mathematics of perceptrons, activation functions, and neural network architecture.
- Detailed exploration of learning mechanisms including gradient descent and backpropagation, with mathematical explanations and practical examples.

Module 6: Hands-On Projects